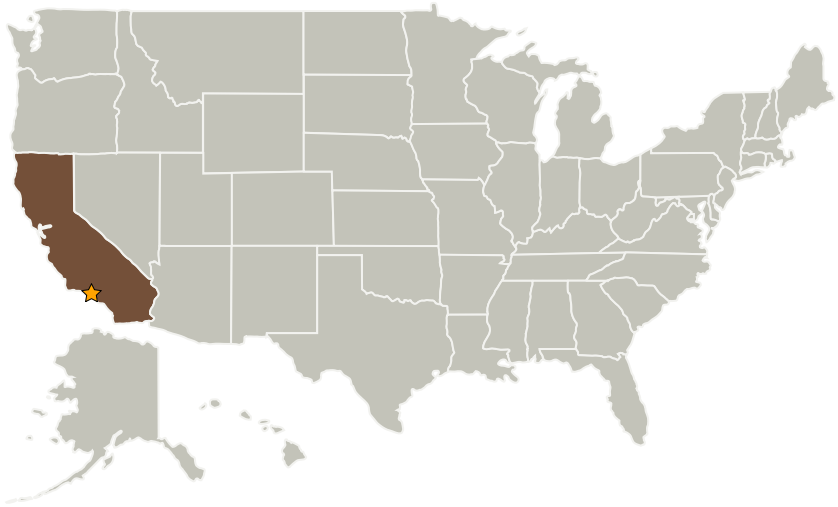
Hybrid Powder - Single Crystal X-Ray Diffraction Instrument for Planetary Mineralogical Analysis of Unprepared Samples, Phase I

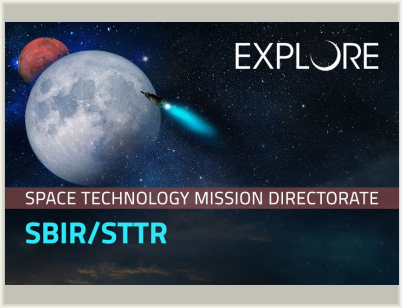
Completed Technology Project (2008 - 2008)

Project Introduction

We propose to develop a planetary exploration XRD/XRF instrument based on a hybrid diffraction approach that complements powder XRD analysis, similar to that of the CheMin instrument of MSL, with single crystal diffraction analysis. Powder XRD will be used when fine grained samples are available, either as received or prepared by a sample grinding facility onboard the lander. Single crystal XRD using polychromatic radiation (Laue diffraction) will be applied when samples are too coarse to use pXRD. Laue analysis will allow identification of minerals in unprepared samples and enable ab-initio determination of crystalline phases unknown to current crystallographic databases. The concept can be applied as a contact instrument fitted to the robotic arm, or to an onboard instrument. Both transmission and reflection geometries are possible. We will develop the system for Venus surface deployment. We will emphasize the diffractometer development on high throughput and power efficiency without compromising resolution. The need for high throughput is motivated by the limited life span of a Venus lander. The Phase 1 research will focus on demonstrating the use of Laue diffraction for mineral identification and investigating the technical options for X-ray source, X-ray optics and detectors.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
inXitu, Inc.	Supporting Organization	Industry	Mountain View, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Philippe C Sarrazin

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.3 Thermal Protection Analysis